

Wildlife and Highway Management

Lesson 1: Is There a Problem with Wildlife on Our Roads?

LESSON OVERVIEW

Students must determine whether or not wildlife-vehicle collisions are a legitimate problem on which to spend money. They will be divided into small groups and given some data regarding this situation. Each group must analyze and present their data to the class. Then, each student will independently reach a conclusion and write a brief essay supporting it.

SUGGESTED GRADE LEVELS

- 7 – 12

ENDURING UNDERSTANDINGS

- Scientists often work in teams to solve problems.
- Accurate and reliable data need to be analyzed impartially to develop conclusions.

OBJECTIVES

Students will:

- Make a graph to represent numerical information.
- Analyze graphs to come to a conclusion.
- Write an essay in which their conclusions are supported by facts.

ARIZONA DEPARTMENT OF EDUCATION STANDARDS

Grade	Science	Mathematics	Writing
7	S1-C3-01; S1-C3-05; S1-C4-05; S3-C1-03; S3-C1-04; S3-C2-01; S4-C3-04	S2-C1-04; S2-C1-05; S2-C1-07; S2-C1-08; S2-C1-09	S2-C1-01; S2-C1-03; S2-C1-04; S2-C2-03; S2-C2-05; S2-C3-02; S2-C3-04; S2-C4-01; S2-C4-03; S2-C5-02; S3-C4-01
8	S1-C3-01; S1-C3-05; S1-C4-01; S1-C4-03; S1-C4-05; S3-C1-01; S3-C2-01	S2-C1-07; S2-C1-08	
High School	S1-C1-01; S1-C4-01; S1-C4-02; S1-C4-03; S1-C4-04; S3-C1-01; S3-C1-03; S3-C1-04; S3-C2-03	S2-C1-08; S2-C1-09	S2-C1-03; S2-C1-05; S2-C2-03; S2-C2-05; S2-C3-02; S2-C3-03; S2-C4-01; S2-C4-02; S2-C4-03; S2-C5-03; S3-C4-01

Note: The full text of these standards can be found in Appendix A.

TIME FRAME

- Two days (45 minutes each day)



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MATERIALS

- *Wildlife-Vehicle Collision Data Analysis* worksheets (one per group)
- Butcher paper (one per group)
- Markers
- Rulers
- *Is There a Problem? Rubric* (one per student)

TEACHER PREPARATION

- Make copies of the *Wildlife-Vehicle Collision Data Analysis* worksheets. Please note that there are six versions of this worksheet. Each group should get a different version. You might also want to make enough copies for each group member to have one.
- Make copies of the *Is There a Problem? Rubric* for each student.
- Gather enough materials for six groups.

SUGGESTED PROCEDURES

1. Divide the class into six groups of equal size. Number the groups, 1 through 6.
2. Hand out the *Wildlife-Vehicle Collision Data Analysis* worksheets.
3. As a class, read the information presented in the first three paragraphs. This will give the students a basic idea of what to expect.
4. Inform them that each group will be looking at the data concerning one small aspect of this whole situation. Each group must become experts on their part of the problem. After analyzing their data, they will be presenting the information to the class. Emphasize that they must pay attention to all of the presentations because they will use all of the information presented to determine what should be done, if anything, to prevent wildlife-vehicle collisions.
5. Let the groups work. Allow enough time for them to look at the data, graph it, and prepare their presentations. This will probably take the remainder of Day 1.
6. Ask each group in numerical order to make their presentation. Advise the students that they should take notes about important parts because they will be writing an essay on what they think should be done.
7. When all groups have presented, inform the students that they will now be working independently. Each student will write a brief essay summarizing the information that was presented by each group and coming to their own conclusion. They must first decide if there is a problem with wildlife-vehicle collisions, and, if so, what types of management measures can be used to control or prevent them. At this point, each student should be working independently. Hand out the rubric so that each student knows how the paper will be graded. Students who do not finish in the allotted class time may work on the essay as a homework assignment.

ASSESSMENT

- Group presentations
- Individual essay



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EXTENSIONS

- Have the students construct a graph using Excel and prepare their presentations using PowerPoint.



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Appendix A: Arizona Department of Education Standards – Full Text

Science Standards

Grade	Strand	Concept	Performance Objective
7	1	3 – Analysis and Conclusions	1 – Analyze data obtained in a scientific investigation to identify trends 5 – Formulate a conclusion based on data analysis
		4 – Communication	5 – Communicate the results and conclusion of the investigation
	3	1 – Changes in Environment	3 – Propose possible solutions to address the environmental risks in biological or geological systems 4 – Analyze the environmental risks caused by human interaction with biological or geological systems
		2 – Science and Technology in Society	1 – Propose viable methods of responding to an identified need or problem
	4	3 – Populations of Organisms in an Ecosystem	4 – Evaluate data related to problems associated with population growth and the possible solutions
8	1	3 – Analysis and Conclusions	1 – Analyze data obtained in a scientific investigation to identify trends 5 – Explain how evidence supports the validity and reliability of a conclusion
		4 – Communication	1 – Communicate the results of an investigation 3 – Present analyses and conclusions in clear, concise formats 5 – Communicate the results and conclusions of the investigation
	3	1 – Changes in Environment	1 – Analyze the risk factors associated with natural, human induced, and/or biological hazards
		2 – Science and Technology in Society	1 – Propose viable methods of responding to an identified need or problem



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Science Standards Continued

Grade	Strand	Concept	Performance Objective
High School	1	1 – Observations, Questions, and Hypotheses	1 – Evaluate scientific information for relevance to a given problem
		4 – Communication	1 – For a specific investigation, choose an appropriate method for communicating the results 2 – Produce graphs that communicate data 3 – Communicate the results clearly and logically 4 – Support conclusions with logical scientific arguments
	3	1 – Changes in Environment	1 – Evaluate how the processes of natural ecosystems affect, and are affected by, humans 3 – Assess how human activities can affect the potential for hazards 4 – Evaluate how urban development affects the quality of the environment
		2 – Science and Technology in Society	3 – Support a position on a science or technology issue

Mathematics Standards

Grade	Strand	Concept	Performance Objective
7	2	1 – Data Analysis (Statistics)	4 – Interpret data displays including histograms, stem-and-leaf plots, circle graphs, and double line graphs 5 – Answer questions based on data displays including histograms, stem-and-leaf plots, circle graphs, and double line graphs 7 – Interpret trends from displayed data 8 – Compare trends in data related to the same investigation 9 – Solve contextual problems using histograms, line graphs or continuous data, double bar graphs, and stem-and-leaf plots
8	2	1 – Data Analysis (Statistics)	7 – Formulate reasonable predictions based on a given set of data 8 – Compare trends in data related to the same investigation
High School	2	1 – Data Analysis (Statistics)	8 – Make reasonable predictions for a set of data, based on patterns 9 – Draw inferences from charts, tables, graphs, plots, or data sets



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Writing Standards

Grade	Strand	Concept	Performance Objective
7 – 8	2	1 – Ideas and Content	1 – Use clear, focused ideas and details to support the topic 3 – Develop a sufficient explanation or exploration of the topic 4 – Include ideas and details that show original perspective
		2 – Organization	3 – Place details appropriately to support the main idea 5 – Construct paragraphs by arranging sentences with an organizing principle (e.g., to develop a topic, to indicate a chronology)
		3 – Voice	2 – Convey a sense of identity through originality, sincerity, liveliness, or humor appropriate to the topic and type of writing 4 – Choose appropriate voice (e.g., formal, informal, academic discourse) for the audience and purpose
		4 – Word Choice	1 – Use accurate, specific, powerful words that effectively convey the intended message 3 – Use vocabulary that is original, varied, and natural
		5 – Sentence Fluency	2 – Create sentences that flow together and sound natural when read aloud
	3	4 – Persuasive	1 – Write persuasive text that: a) establishes and develops a controlling idea, b) supports arguments with detailed evidence, c) includes persuasive techniques, and d) excludes relevant information
High School	2	1 – Ideas and Content	3 – Provide sufficient, relevant and carefully selected details for support 5 – Include ideas and details that show original perspective and insights
		2 – Organization	3 – Place details appropriately to support the main idea 5 – Employ a variety of paragraphing strategies (e.g., topical, chronological, spatial) appropriate to application and purpose
		3 – Voice	2 – Convey a sense of identity through originality, sincerity, liveliness, or humor appropriate to the topic and type of writing 3 – Choose appropriate voice (e.g., formal, informal, academic discourse) for the application

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Writing Standards Continued

Grade	Strand	Concept	Performance Objective
High School	2	4 – Word Choice	1 – Use accurate, specific, powerful words and phrases that effectively convey the intended message 2 – Use vocabulary that is original, varied, and natural 3 – Use words that evoke clear images
		5 – Sentence Fluency	3 – Demonstrate a flow that is natural and powerful when read aloud
	3	4 – Persuasive	1 – Write a persuasive composition that: a) states a position or claim, b) presents detailed evidence, examples, and reasoning to support effective arguments and emotional appeals, c) attributes sources of information when appropriate, d) structures ideas, and e) addresses the reader's concerns (grades 9 – 10) or acknowledges and refutes opposing arguments (grades 11 – 12)



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Appendix B: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

- A. *Wildlife-Vehicle Collision Data Analysis* – Six different worksheets that present relevant information (6 pages)
- B. *Is There a Problem? Rubric* – One method to evaluate student writing (1 page)

